

TEGO[®] Sun Z 500

A microfine ZnO with broad spectrum UV protection.

- broad spectrum UV absorber
- no whitening
- increases the SPF when combined with other UV absorbers
- uncoated
- excellent skin feel
- non-toxic, non-sensitising
- photostable
- easy to disperse

Goldschmidt Personal Care

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INCI Name (CTFA Name)

Zinc Oxide

Chemical and physical properties (not part of specifications)

Form	powder
ZnO content [%]	> 99.5
Primary particle size [nm]	approx. 10-60

500 with a transparent appearance and a pleasant skin feel.

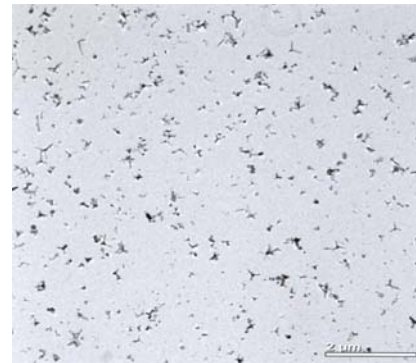


Fig. 1: TEM record of TEGO® Sun Z 500

Properties

TEGO® Sun Z 500 is a microfine uncoated Zinc Oxide for elegant and mild cosmetic products with broad spectrum UV absorption. The appearance of sun screen products containing TEGO® Sun Z 500 shows no whitening and is transparent on skin after rub-in.

Zinc Oxide is well known as an active ingredient in skin protection products e.g. baby care, make-up, lip products, pharmaceutical preparations and sun care products.

Providing both mildness and non-sensitising properties, it is an optimal ingredient with additional UV protection for every day cosmetics.

Made especially for the sun care area, TEGO® Sun Z 500 provides a combination of benefits to the formulation.

Compared to micronised Titanium Dioxide, Zinc Oxide performs with minimal tendency to whiten the skin.

Because of the small particle size (Fig. 1), it is possible to formulate up to 15 % TEGO® Sun Z

Due to the increased consumer awareness of the effects of long wave UV-A radiation on the skin, a high UV-A protection for use in every day products becomes increasingly more important.

TEGO® Sun Z 500 provides a superior broad spectrum protection up to a wavelength of 380 nm (Fig. 2).

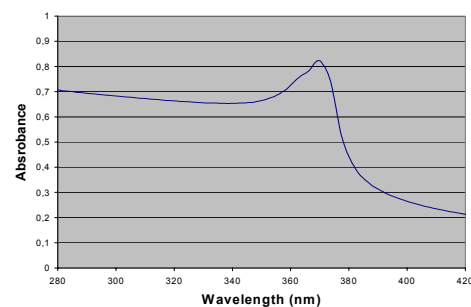


Fig. 2: UV/VIS spectrum of TEGO® Sun Z 500

Combinations with highly effective organic UV-B absorbers and Titanium Dioxide have shown powerful synergistic effects (e.g. with TiO₂, Ethylhexyl Triazone, Ethylhexyl

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Methoxycinnamate, Phenylbenzimidazole Sulfonic Acid, Bis-Ethylhexyloxyphenol Methoxyphenol Triazine, Diethylhexyl Butamido Triazone, Octocrylene....). By utilising TEGO® Sun Z 500, lower amounts of organic filters can be used to achieve the same SPF. Therefore consumers' exposure to the organic sun screen filters can be minimised.

Hence, TEGO® Sun Z 500 offers an excellent way to provide a good broad spectrum protection together with an aesthetically superior appearance.

TEGO® Sun Z 500 is non-toxic and doesn't significantly shift the pH-value, if it is accurately dispersed into the oil phase of cosmetic emulsions.

TEGO® Sun Z 500 is also characterised by its high purity (> 99.5 %) and a very low content of heavy metals.

Application

- Daily wear lotions and creams
- O/W and W/O Sunscreens
- Sun protection for kids

Processing hints

W/O Emulsions

W/O formulations are produced according to the common practice.

To achieve the best SPF response and highest transparency, it is recommended to grind TEGO® Sun Z 500 directly with the oil phase of the emulsion with high sheer aggregates. Long term stable emulsions with a better distribution

of particles can be obtained by adding small amounts of fatty acids e.g. isostearic acid as a dispersing aid.

O/W Emulsions

Formulating O/W emulsions with TEGO® Sun Z 500 is very simple. The easiest way is to grind the pigment into the water phase by using Graham's salt as dispersing agent. Due to the dispersing the pH may shift to the alkaline area. To adjust a desired pH value of 6.8-7.5 we recommend the use of citric or lactic acid (a solution of ZnSO₄ in water has also shown a good pH stabilising effect). The neutralisation can be done before or after the homogenisation step.

To prevent the pigment from reflocculating, the pH value should not drop below a pH value of 6.8 during the production process.

As uncoated ZnO is not compatible with carbomer, it is recommended to use other consistency enhancers e.g. GMS/fatty alcohol, acrylamide gels, or xanthan gum to obtain long term storage stable formulations.

If the ZnO has to be charged to the oil phase, we recommend the use of the hydrophobically coated TEGO® Sun Z 800.

Recommended usage concentration

1 - 25 % TEGO® Sun Z 500

Packaging

280 kg pallet (28 x 10 kg bag)

Storage

Store the product at ambient temperatures and dry conditions.

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Approval

With the 26th amendment to the European Cosmetics Regulation Zinc Oxide is not finally approved as UV filter in appendix VII. The use permission is extended temporarily from year to year, until a final decision of the SCCNFP (Scientific committee for cosmetics and non-food products) is reached.

In the United States the OTC sunscreen monograph allows the use of up to 25% Zinc Oxide.

Hazardous goods classification

Information concerning

- classification and labelling according to regulations for transport and for dangerous substances
- protective measures for storage and handling
- measures in accidents and fires
- toxicity and ecological effects

is given in our material safety data sheets.

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Guide Line Formulations

O/W Facial Lotion with Sun Protection	
Ma 58/03	in vivo SPF* 7
Phase A	
TEGO® Care 215 (Ceteareth-15; Glyceryl Stearate)	2.5
TEGO® Alkanol 18 (Stearyl Alcohol)	2.0
TEGOSOFT® DC (Decyl Cocoate)	3.0
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	5.0
Avocado (Persea Gratissima) Oil	1.5
Ethylhexyl Methoxycinnamate	3.0
Phase B	
Glycerin	3.0
Water	68.8
Sodium Hexametaphosphate	0.2
TEGO® Sun Z 500	3.0
Phase C	
Xanthan Gum	0.4
Water	7.6
Phase D	
Citric Acid (10 % in water)	q.s.
Preservative, Parfum	q.s.
Preparation:	
<ol style="list-style-type: none"> Disperse the pigment in phase B. Heat phase A and B separately to approx. 80 °C. Add phase A to phase B with stirring¹⁾. Homogenise. Cool with gentle stirring to approx. 60 °C and add phase C. Homogenise for a short time. Cool with gentle stirring and add phase D below 40 °C to adjust a pH-value of approx 7. <p>¹⁾ Important: If phase A has to be charged first into the vessel, phase B must be added without stirring.</p>	

* According to the Colipa method (5 persons)

O/W Sun Protection Cream	
Ma 53/03	in vivo SPF* 10
Phase A	
TEGO® Care 450 (Polyglyceryl-3 Methylglucose Distearate)	3.0
TEGIN® M Pellets (Glyceryl Stearate)	2.0
TEGO® Alkanol 18 (Stearyl Alcohol)	2.0
TEGOSOFT® OP (Ethylhexyl Palmitate)	9.0
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	7.5
Bis-Ethylhexyloxyphenyl Methoxyphenol Triazine (Tinosorb S)	3.0
Jjoba (Buxus Chinensis) Oil	5.0
Phase B	
Glycerin	3.0
Water	64.3
Sodium Hexametaphosphate	0.2
TEGO® Sun Z 500	5.0
Phase C	
Citric Acid (10 % in water)	q.s.
Preservative, Parfum	q.s.
Preparation:	
<ol style="list-style-type: none"> Disperse the pigment in phase B. Heat phase A and B separately to approx. 80 °C. Add phase A to phase B with stirring¹⁾. Homogenise. Cool with gentle stirring and add phase C below 40 °C to adjust a pH-value of approx 7. <p>¹⁾ Important: If phase A has to be charged first into the vessel, phase B must be added without stirring.</p>	

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W/O Sun Protection Cream	
Ma 15/03-4	in vitro SPF* 30
Phase A	
ABIL [®] EM 90 (Cetyl PEG/PPG-10/1 Dimethicone)	2.5
Hydrogenated Castor Oil	0.5
Microcrystalline Wax	1.0
ABIL [®] Wax 9840 (Cetyl Dimethicone)	0.25
TEGOSOFT [®] OS (Ethylhexyl Stearate)	12.0
TEGOSOFT [®] M (Isopropyl Myristate)	6.0
Isohexadecane	5.0
Isostearic Acid	1.0
Ethylhexyl Methoxycinnamate	7.0
TEGO [®] Sun Z 500	15.0
Phase B	
Water	49.25
Sodium Chloride	0.5
Preservative, Parfum	q.s.
Preparation:	
<ol style="list-style-type: none"> 1. Heat phase A to approx. 80 °C and disperse the pigment. 2. Add phase B (80 °C or room temperature) slowly while stirring. 3. Homogenise for a short time. 4. Cool with gentle stirring below 30 °C and homogenise again. 	

* Optometrics SPF 290S; PMMA slide; 1 mg/cm²

W/O Sun Protection Cream	
Ma 65/03	in vitro SPF* >40
Phase A	
ABIL [®] WE 09 (Polyglyceryl-4 Isostearate; Cetyl PEG/PPG-10/1 Dimethicone; Hexyl Laurate)	5.0
Hydrogenated Castor Oil	0.5
Microcrystalline Wax	1.0
ABIL [®] Wax 9840 (Cetyl Dimethicone)	0.25
TEGOSOFT [®] OS (Ethylhexyl Stearate)	11.25
Mineral Oil (30 mPas)	10.0
Isostearic Acid	1.0
Ethylhexyl Methoxycinnamate	7.0
TEGO [®] Sun Z 500	15.0
Titanium Dioxide; Trimethoxycaprylylsilane (Aeroxide T-805)	4.0
Phase B	
Water	44.5
Sodium Chloride	0.5
Preservative, Parfum	q.s.
Preparation:	
<ol style="list-style-type: none"> 1. Heat phase A to approx. 80 °C and disperse the pigment. 2. Add phase B (80 °C or room temperature) slowly while stirring. 3. Homogenise for a short time. 4. Cool with gentle stirring below 30 °C and homogenise again. 	

* Optometrics SPF 290S; PMMA slide; 1 mg/cm²

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